

What is claimed is:

1. A semiconductor device manufacturing method,
comprising the steps of:

- 5 forming a semiconductor film over a substrate;
 forming a gate insulating film on the semiconductor film;
 forming a gate electrode on the gate insulating film;
 adding a first impurity to the semiconductor film while
using the gate electrode as a mask;
10 forming a conductive film over the gate insulating film
and the gate electrode;
 forming a sidewall to a side surface of the gate electrode
in a condition of the gate insulating film and the gate electrode
being covered by the conductive film; and
15 adding a second impurity to the semiconductor film while
using the gate electrode and the sidewall as masks.

2. The semiconductor device manufacturing method
according to claim 1, wherein the semiconductor device has a
20 channel forming region with a channel length of 2.0 μm or
shorter.

3. The semiconductor device manufacturing method
according to claim 1, wherein the second impurity is added
25 through the conductive film and the gate insulating film.

4. The semiconductor device manufacturing method
according to claim 1, wherein the semiconductor device

incorporates a logic circuit.

5. A semiconductor device manufacturing method,
comprising the steps of:

5 forming a semiconductor film over a substrate;
forming a gate insulating film on the semiconductor film;
forming a gate electrode on the gate insulating film;
adding a first impurity to the semiconductor film while
using the gate electrode as a mask;

10 forming an insulating film over the gate insulating film
and the gate electrode;

forming a conductive film over the insulating film;

forming a sidewall to a side surface of the gate electrode
in a condition of the insulating film being covered by the
15 conductive film;

adding a second impurity to the semiconductor film while
using the gate electrode and the sidewall as masks.

6. The semiconductor device manufacturing method
20 according to claim 5, wherein the semiconductor device has a
channel forming region with a channel length of 2.0 μm or
shorter.

7. The semiconductor device manufacturing method
25 according to claim 5, wherein the second impurity is added
through the conductive film, the insulating film and the gate
insulating film.

8. The semiconductor device manufacturing method according to claim 5, wherein the semiconductor device incorporates a logic circuit.

5 9. A semiconductor device manufacturing method, comprising the steps of:

forming a semiconductor film over a substrate;

forming a gate insulating film on the semiconductor film;

forming a gate electrode on the gate insulating film;

10 adding a first impurity to the semiconductor film while using the gate electrode as a mask;

forming a conductive film over the gate insulating film and the gate electrode;

15 forming a sidewall to a side surface of the gate electrode in a condition of the gate insulating film and the gate electrode being covered by the conductive film;

adding a second impurity to the semiconductor film while using the gate electrode and the sidewall as masks;

removing the sidewall; and

20 removing the conductive film.

10. The semiconductor device manufacturing method according to claim 9, wherein the semiconductor device has a channel forming region with a channel length of 2.0 μm or shorter.
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11. The semiconductor device manufacturing method according to claim 9, wherein the second impurity is added

through the conductive film and the gate insulating film

12. The semiconductor device manufacturing method according to claim 9, wherein the semiconductor device
5 incorporates a logic circuit.

13. A semiconductor device manufacturing method, comprising the steps of:

forming a semiconductor film over a substrate;
10 forming a gate insulating film on the semiconductor film;
forming a gate electrode on the gate insulating film;
adding a first impurity to the semiconductor film while using the gate electrode as a mask;
forming an insulating film covering the gate insulating
15 film and the gate electrode;
forming a conductive film over the insulating film;
forming a sidewall to a side surface of the gate electrode in a condition of the insulating film being covered by the conductive film;
20 adding a second impurity to the semiconductor film while using the gate electrode and the sidewall as masks;
removing the sidewall; and
removing the conductive film.

25 14. The semiconductor device manufacturing method according to claim 13, wherein the semiconductor device has a channel forming region with a channel length of 2.0 μm or shorter.

15. The semiconductor device manufacturing method according to claim 13, wherein the second impurity is added through the conductive film, the insulating film and the gate
5 insulating film.

16. The semiconductor device manufacturing method according to claim 13, wherein the semiconductor device incorporates a logic circuit.

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17. A semiconductor device manufacturing method, comprising the steps of:

forming a semiconductor film over a substrate;
forming a gate insulating film on the semiconductor film;
15 forming a conductive film on the gate insulating film;
forming a gate electrode on the conductive film;
adding a first impurity to the semiconductor film while using the gate electrode as a mask;

forming a sidewall to a side surface of the gate electrode
20 in a condition of the gate insulating film being covered by the conductive film; and

adding a second impurity to the semiconductor film while using the gate electrode and the sidewall as masks through the conductive film and the gate insulating film.

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18. The semiconductor device manufacturing method according to claim 17, wherein the semiconductor device has a channel forming region with a channel length of 2.0 μm or

shorter.

19. The semiconductor device manufacturing method according to claim 17, wherein the first impurity is added
5 through the conductive film and the gate insulating film.

20. The semiconductor device manufacturing method according to claim 17, wherein the semiconductor device incorporates a logic circuit.

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21. A semiconductor device manufacturing method, comprising the steps of:

forming a semiconductor film over a substrate;

forming a gate insulating film on the semiconductor film;

15 forming a conductive film on the gate insulating film;

forming a gate electrode on the conductive film;

adding a first impurity to the semiconductor film while using the gate electrode as a first mask;

20 forming a sidewall to a side surface of the gate electrode in a condition of the gate insulating film being covered by the conductive film;

adding a second impurity to the semiconductor film while using the gate electrode and the sidewall as masks;

removing the sidewall; and

25 processing the conductive film while using the gate electrode as a second mask.

22. The semiconductor device manufacturing method

according to claim 21, wherein the semiconductor device has a channel forming region with a channel length of 2.0 μm or shorter.

5 23. The semiconductor device manufacturing method according to claim 21, wherein the first impurity is added through the conductive film and the gate insulating film.

 24. The semiconductor device manufacturing method
10 according to claim 21, wherein the second impurity is added through the conductive film and the gate insulating film.

 25. The semiconductor device manufacturing method according to claim 21, wherein the semiconductor device
15 incorporates a logic circuit.